इंटरनेट मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”
Mazdoor Kisan Shakti Sangathan
“The Right to Information, The Right to Live”

“पुराने को छोड नये के तरफ”
Jawaharlal Nehru
“Step Out From the Old to the New”

IS 12013 (1987): Lead-acid batteries for 110 volts train lighting system with monobloc containers [ETD 11: Secondary Cells and Batteries]

“ज्ञान से एक नये भारत का निर्माण”
Satyanarayan Gangaram Pitroda
“Invent a New India Using Knowledge”

Act Number 22 of 2005
The Indian Parliament
RIGHT TO INFORMATION

Made Available By
Public.Resource.Org

“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”
Bhartṛhari—Nītiśatakam
“Knowledge is such a treasure which cannot be stolen”

BLANK PAGE

BRUTUM FULMEN

IGNORANTIA JURIS NON EXCUSAT

PROTECTED BY COPYRIGHT

(Reaffirmed 2002)

Indian Standard

SPECIFICATION FOR LEAD ACID BATTERIES FOR 110 VOLTS TRAIN LIGHTING SYSTEM WITH MONOBLOC CONTAINERS

UDC 621·355·2 : 628·977·8 : 625·2

© *Copyright* 1987

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 4 *October* 1987

Indian Standard

SPECIFICATION FOR LEAD ACID BATTERIES FOR 110 VOLTS TRAIN LIGHTING SYSTEM WITH MONOBLOC CONTAINERS

Secondary Cells and Batteries Sectional Committee, ETDC 11

Chairman	*Representing*
Shri A. Das Gupta	Chloride India Ltd, Calcutta
Members	
Shri A. P. d'Sousa (*Alternate* to Shri A. Das Gupta)	
Shri U. R. G. Acharya	Department of Telecommunications (Ministry of Telecommunications), New Delhi
Shri N. C. S. R Acharyulu (*Alternate*)	
Lt-Cdr Amrik Singh, IN	Naval Headquarters (Ministry of Defence), New Delhi
Lt-Cdr V. M. Sharma, IN (*Alternate*)	
Shri S. K. Biswas (Gupta)	Directorate General of Mines Safety, Dhanbad
Shri N. K. Sen (*Alternate*)	
Shri K. L. Garg	Directorate General of Supplies and Disposals (Inspection Wing), New Delhi
Shri R. P. Sehgal (*Alternate*)	
Joint Director Standards (Electrical) / 8	Railway Board (Ministry of Railways), Lucknow
Assistant Design Engineer Standards (Electrical) / 8 (*Alternate*)	
Col G. R. Mahadevan	Ministry of Defence (DGI)
Shri B. K. Satyanarayana Rao (*Alternate*)	
Lt-Col B. R. Mahajan	Directorate of Electrical Mechanical Engineerings (Ministry of Defence), New Delhi
Maj M. M. K. Sindhi (*Alternate*)	
Shri P. R. Malhan	Development Commissioner Small Scale Industries (Ministry of Industry), New Delhi
Shri S. R. Singh (*Alternate*)	

(*Continued on page* 2)

© *Copyright* 1987
BUREAU OF INDIAN STANDARDS
This publication is protected under the *Indian Copyright Act* (XIV of 1957) and reproduction in whole or in part by any means except with written permission of the publisher shall be deemed to be an infringement of copyright under the said Act.

(*Continued from page* 1)

Members	*Representing*
Shri K. C. Sharma	Directorate General of Technical Development, New Delhi
Shri K. L. Nangia (*Alternate*)	
Shri B. Mukhopadhyay	National Test House, Calcutta
Shri J. P. Srivastava (*Alternate*)	
Shri S. B. Niyogi	Directorate of Technical Development and Production (Air), Ministry of Defence, New Delhi
Shri K. Mariyappa (*Alternate*)	
Shri N. M. Patel	Gujarat Electricity Board, Vadodara
Shri M. B. Patel (*Alternate*)	
Shri K. Ramakrishna Rao	Andhra Pradesh State Electricity Board, Hyderabad
Shri K. Balarama Reddi (*Alternate*)	
Shri C. S. Ramanathan	AMCO Batteries Ltd, Bangalore
Shri R. K. Hebbar (*Alternate*)	
Shri C. Ranganathan	Lucas TVS Ltd, Madras
Shri S. T. Shrin (*Alternate*)	
Shri Sachindra Prasad Saha	Indian Batteries Manufacturers' Association, Calcutta
Shri Samarendra Prasad Saha (*Alternate*)	
Shri K. R. Sekhar	Willard India Ltd, New Delhi
Shri H. V. Pande (*Alternate*)	
Dr P. M. Shah	Standard Batteries Ltd, Bombay
Shri V. S. Deshmukh (*Alternate*)	
Shri S. Srinivasan	UB-MEC Batteries Ltd, Bangalore
Shri A. K. Joishy (*Alternate*)	
Shri N. K. Srivastava	Rail India Technical and Economic Services Ltd, New Delhi
Shri S. R. Saha (*Alternate*)	
Shri P. V. Vasudeva Rao	Central Electrochemical Research Institute, (CSIR), Karaikudi
Dr N. Venkatakrishnan (*Alternate*)	
Shri S. P. Sachdev, Director (Elec tech)	Director General, BIS (*Ex-officio Member*)

Secretary

Shri V. Dewan
Deputy Director (Elec tech), BIS

(***Continued on page*** **14**)

Indian Standard

SPECIFICATION FOR LEAD ACID BATTERIES FOR 110 VOLTS TRAIN LIGHTING SYSTEM WITH MONOBLOC CONTAINERS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 25 February 1987, after the draft finalized by the Secondary Cells and Batteries Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 This standard covers the requirements and test for lead acid monobloc type batteries used for train lighting.

0.3 These batteries are required to meet the power demand of the lights and fans of the coaches during halts or slow running.

0.4 The supplier shall furnish information on performance as given in Appendices A and B while submitting tenders.

0.5 These batteries shall generally conform to IS : 6848-1979* except for certain aspects such as capacity, construction, and the level of electrolyte in lead acid batteries with monobloc containers.

0.6 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960†. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers the method of test, performance and other requirements of secondary lead acid storage batteries for 110 volts train

---

*Specification for lead acid batteries for train lighting and air-conditioning services (*first revision*).

†Rules for rounding off numerical values (*revised*).

lighting system with 3 cells, 6 volts monobloc containers, in conjunction with 3 or 4·5 kW on externally regulated axle driven induction type brushless alternator.

2. TERMINOLOGY

2.0 For the purpose of this standard, the definitions given in IS : 1885 (Part 8)-1986* and IS : 8320-1976†, in addition to the following, shall apply.

2.1 Type Tests — Tests carried out to prove conformity with the requirements of this standard. These are intended to prove the general quality and design of a given type of battery.

2.2 Acceptance Tests — Tests carried out on samples selected from a lot for the purpose of verifying the acceptability of the lot.

2.2.1 *Lot* — All batteries of the same type, design and rating, manufactured by the same factory during the same period using the same process and materials.

2.3 Electrolyte — Aqueous solution of sulphuric acid, for ionic conduction and electrochemical reaction during passage of current through a cell.

2.4 Terminal Post (Lug) — A post (lug) of a cell or battery to which an internal electrical circuit is connected.

2.5 Float — A device for the performance of indicating the level of electrolyte in the cell container.

2.6 Float Guide — A removable bush of anti-splash type to facilitate easy vertical movement of float stem.

2.7 Filling Plug — A removable plug for fitting into the filler-hole.

3. MATERIALS AND CONSTRUCTION

3.1 The batteries shall be supplied in set, each set consisting of 19 (56 cells) monobloc units and each unit consisting of 3 cells. The monobloc unit shall be identical in type and shape.

3.2 The monobloc unit will be housed in two battery boxes with length of cells parallel to track.

3.3 The maximum overall dimensions of each monobloc shall not exceed 450 mm (length) 186 mm (width) and 385 mm (height) (up to top of

---

*Electrotechnical vocabulary : Part 8 Secondary cells and batteries (*first revision*).

†General requirements and methods of test for lead-acid storage batteries (*first revision*).

terminal excluding the float). The tolerances on each dimension will be ±5·0 mm.

3.4 Mass of Monobloc Unit — Under consideration.

3.5 Container and Lid

3.5.1 The cells shall be supplied in containers which shall conform to IS : 1146-1972*.

3.5.2 *Cell Lids* — Cell lids shall be either drop-on type together with suitable rubber gasket or of the deep-sealing type suitable for use and bituminous sealing compound, with close-fitting terminal post outlets and with vent-holes suitable for accommodating the float guide and filling plug/vent plugs.

3.5.3 *Vent-Plug* — Each cell shall be provided with adequate means both for venting and for servicing of the eletrolyte. The vent-plug shall be of the anti-splash type, preferably with more than one exit hole, and shall allow the gases to escape freely but shall effectively prevent acid particles or spray from coming out. On removal of vent-plug drawing of the electrolyte samples, servicing and checking of the electrolyte level shall be possible.

3.5.3.1 Where the venting system is incorporated in the float guide, filling plugs may be provided. The filler plugs on removal, shall permit servicing and checking of electrolyte.

3.5.3.2 *Dia and pitch thread* — Under consideration.

3.6 Each monobloc unit shall be provided with two terminal lugs, one negative and one positive according to Fig. 1 in IS : 6848 - 1979† or according to Fig. 1A and 1B, respectively.

3.7 Intercell connector and fasteners for intercell connectors and end cell connectors shall be according to IS : 6848-1979†.

3.8 Intercell connectors of suitable design shall be provided.

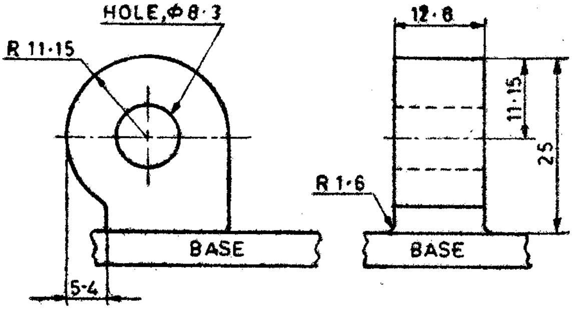
3.9 Electrolyte — It shall be prepared from battery grade sulphuric acid conforming to IS : 266-1976‡.

---

*Specification for rubber and plastic containers for lead acid storage batteries.

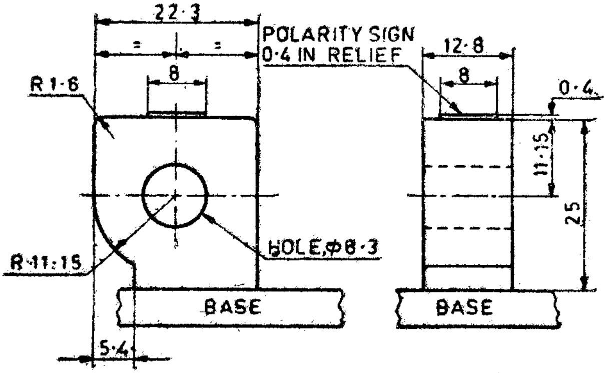
†Specification for lead acid batteries for train lighting and air-conditioning services (*first revision*).

‡Specification for sulphuric acid (*revised*).



NEGATIVE TERMINAL POST
(LUG)

1 A



POSITIVE TERMINAL POST
(LUG)

1 B

General Tolerance ± 2·5 Percent
All dimensions in millimetres.

FIG. 1 TERMINAL TAKE-OFFS FOR 110 V TRAIN LIGHTING BATTERIES

3.9.1 The level of the electrolyte shall be that specified by the manufacturer and shall be at least 50 mm above the top edge of the separator in fully topped up condition.

3.9.2 The specific gravity of electrolyte, when the battery is in fully charged condition at 27°C, shall be between 1·210 and 1·220.

3.9.3 After a full charge, the specific gravity and temperature of the electrolyte shall be measured and the specific gravity corrected to 27°C using the formula :

$$SG_{27} = SG_t + 0{\cdot}000\,7\,(t - 27)$$

where

SG_{27} = specific gravity at 27°C,

SG_t = specific gravity at t°C, and

t = temperature of the electrolyte (*see* **5.4.6** of IS : 6848-1979*).

3.10 Water — Water intended for storage batteries, conforming to IS : 1069-1964† shall be added to bring the level of electrolyte to approximately the correct height during the course of testing except when specifically stated otherwise. It shall be added just before the charge or during early part of the charge so that gassing will thoroughly mix it with the electrolyte.

3.11 Separator — Separator shall be microporous rubber, plastic or any other material conforming to IS : 6071-1986‡.

3.12 Sealing Compound — Sealing compound, if bitumen based, shall conform to IS : 3116-1985§.

4. RATING

4.1 The rating assigned to the battery shall be 90 Ah at 10-h rate of discharge.

5. TESTS AND PERFORMANCE

5.1 Classification of Tests

5.1.1 *Type Tests* — The following shall constitute the type tests:

a) Capacity at 10-h rate according to **5.4** of IS : 6848-1979*;

---

*Specification for lead acid batteries for train lighting and air-conditioning services (*first revision*).

†Specification for water for storage batteries (*revised*).

‡Specification for synthetic separators for lead-acid batteries.

§Specification for sealing compound for lead-acid batteries.

b) Capacity at 5-h rate according to **5.5** of IS : 6848-1979*;

c) Capacity at 3-h rate according to **5.6** of IS : 6848-1979*;

d) Watt-hour and ampere-hour efficiency tests according to **5.7** of 6848-1979*;

e) Retention of charge according to **5.8** of IS : 6848-1979*;

f) Life test according to **5.9** of IS : 6848-1979*;

g) Storage test according to **5.10** of IS : 6848-1979*;

h) Air pressure test according to **5.11** of IS : 6848-1979*;

j) Vibration test according to **5.12** of IS : 6848-1979*;

k) Electrolyte temperature-rise test according to **5.13** of IS : 6848-1979*;

m) Checking of dimensions, mass, markings and workmanship according to **5.14** of IS : 6848-1979*; and

n) Material and component specification verification test according to **5.15** of IS : 6848-1979*.

5.1.1.1 *Sequence of type tests* -- The sequence of type tests and the number of samples required shall be in accordance with Appendix C.

NOTE — The cell shall be covered by type approval certificates from an appropriate authority. Significant variations in the design shall be covered by separate type approval certificates. The cell of new design shall be proto-type tested for which samples offered by the manufacturer shall be accepted. For type test samples drawn from mass production at random shall be retested after 5 years. In case of unsatisfactory performance of cells, type testing can be repeated earlier at the discretion of the approving authority.

5.1.1.2 If any of the samples fails in the relevant type test, the testing authority may call for fresh samples not exceeding twice the original number of cells tested in that particular test and subject them again to the test(s) in which failure occurred. If there is any failure in the retest(s), the type shall be considered as not having passed the requirements of this standard.

5.1.2 *Acceptance Tests*

5.1.2.1 The following test shall be conducted as acceptance tests :

a) Capacity test at 10-h rate according to **5.4** of IS : 6848-1979*; and

---

*Specification for lead-acid batteries for train lighting and air-conditioning services (*first revision*).

b) Checking of dimensions, mass markings and workmanship according to **3** and **6**.

5.1.2.2 *Sampling scheme and criteria for acceptance* — A recommended sampling scheme and criteria for the acceptance of the lot for various lot sizes is given in Appendix D.

6. MARKING AND PACKING

6.1 Marking — Either the shorter or longer sides of each container shall have manufacturers name or trade-mark. The following details will be impressed on the connector in the as cast form.

a) Rating at 10-hour discharge rate, and

b) Specific gravity of the electrolyte in the fully charged condition at 27±2°C.

6.1.1 The year and month of manufacture shall be punched on the terminal lug base.

6.1.2 The batteries may also be marked with the Standard Mark.

NOTE — The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

6.2 The batteries shall be suitably packed so as to avoid any loss or damage during transit.

7. MANUAL OF INSTRUCTIONS

7.1 The manufacturer shall supply one copy of instructions manual for initial treatment and routine maintenance on service, with every batch of batteries ordered.

APPENDIX A

(*Clause* 0.4)

SCHEDULE OF DESIGN PARTICULARS

The following particulars are required to be supplied by the manufacturer with the quotation:

Sl No.	*Description*	*Particulars to be filled in*
1.	Make	....
2.	Type of unit	....
3.	Manufacturer's nomenclature	....
4.	Overall dimensions of unit (length × width × height)	..........m
5.	Mass per unit with acid	..................kg
6.	Cell container material	....
7.	Type of positive plates	....
8.	Type of negative plates	....
9.	Separators	....
10.	Maximum electrolyte temperature that the cell/battery withstand without any damage:	....
	a) continuously	.............°C
	b) for a short period	.............°C
11.	Electrolyte height above the top of the separators	............mm
12.	Electrolyte height below the bottom plates	............mm
13.	Quantity of electrolyte per cell	..........litres
14.	Specific gravity of electrolyte for initial filling at 27°C	....
15.	Details of initial treatment recommended	....
16.	Material of terminal and intercell connectors	....
17.	Normal charging rate	...............A

APPENDIX B

(*Clause* 0.4)

SCHEDULE OF PERFORMANCE

Sl No.	*Description*	*Particulars to be filled in*
0.	Batteries offered according to this standard shall be covered by a type approval certificate from an appropriate authority. All variations in design shall be covered by a separate type approval certificate. Following particulars regarding the type tests shall be supplied by the manufacturer along with the certificate against any quotation or tender.	
1.	Ammeter-hour capacity	............ampere-hour
2.	Retention of charge	............percent
3.	Resistance to overcharge	............hours
4.	Life	............cycles
5.	Storage	............ampere-hour
6.	Ampere-hour efficiency	............percent
7.	Watt-hour efficiency	............percent
8.	Rise in electrolyte temperature above the ambient air temperature when charged from fully discharged to fully charged condition at normal rate.	............°C
9.	Charge and discharge curves with voltage versus time showing the performance of the cell for discharge at 10-h rate and charge at normal rate	....
10.	Recommendations for a reasonable fast charging method without affecting the manufacturer's guarantee	....

APPENDIX C

(*Clause* 5.1.1.1)

SEQUENCE OF TYPE TESTS

	Test	*Sample Number*								
		1	2	3	4	5	6	7	8	9
*a)	Checking of dimensions, mass, markings and workmanship	x	x	x	x	x	x	x	x	x
b)	Capacity at 10-h rate	x	x	x	x	x	x	x	x	x
c)	Material and component specification verification test	—	—	—	—	—	—	—	—	x
d)	Air pressure	—	—	—	—	—	—	—	x	x
e)	Storage	—	—	—	—	—	—	—	x	x
f)	Vibration	x	x	—	—	—	—	—	—	—
g)	Life	—	—	x	x	x	—	—	—	—
h)	Watt-hour and ampere-hour efficiencies	—	—	—	—	—	x	x	—	—
j)	Capacity at 5-h rate	—	—	—	—	—	x	x	—	—
k)	Capacity at 3-h rate	—	—	—	—	—	x	x	—	—
m)	Retention of charge	—	—	—	—	—	x	x	—	—
n)	Electrolyte temperature rise	—	—	—	—	—	x	x	—	—

APPENDIX D

(*Clause* 5.1.2.2)

SAMPLING PROCEDURE FOR ACCEPTANCE TESTS

D-1. LOT

D-1.1 In a consignment, all the batteries of the same rating manufactured from the same material under similar conditions of production shall be grouped together to constitute a lot.

---

*Mass to be checked only for sample numbers 1 to 7.

D-1.1.1 These batteries in the sample shall be drawn from the lot at random. For the purpose of random selection, reference may be made to IS : 4905-1968*.

D-2. SAMPLE SIZE AND CRITERIA FOR CONFORMITY

D-2.1 Batteries in the sample shall be drawn from each lot for ascertaining the conformity of the lot with respect to the requirements of acceptance tests. For this purpose, a single sampling plan with inspection level III and AQL of 2·5 percent according to Table 1 and 2 of 2500 (Part 1)-1973† shall be selected.

D-2.2 The batteries so selected in the sample shall be subjected to the acceptance tests. A battery shall be termed as defective if it fails to meet any one or more of the requirements of acceptance tests. The lot shall be considered as conforming to the requirements of acceptance tests, if the number of defectives in the sample is less than or equal to the acceptance number given in Table 2 of IS : 2500 (Part 1)-1973† corresponding to the sample size chosen and AQL value of 2·5 percent; otherwise rejected.

---

*Methods for random sampling.

†Specification for sampling inspection tables : Part 1 Inspection by attributes and by count of defects (*first revision*).

(*Continued from page* 2)

Panel for Railway Batteries, ETDC 11 : P 12

Convener	*Representing*
JOINT DIRECTOR STANDARDS (ELECTRICAL) / 8	Railway Board (Ministry of Railways), Lucknow
Members	
ASSISTANT DESIGN ENGINEER (ELECTRICAL) / 8 (*Alternate* to Joint Director Standards (Electrical) / 8	
SHRI A. P. d' SOUSA	Chloride India Ltd, Calcutta
SHRI A. N. CHATTOPADHYA (*Alternate*)	
DR P. M. SHAH	Standard Batteries Ltd, Bombay
SHRI V. S. DESHMUKH (*Alternate*)	
SHRI C. S. RAMANATHAN	AMCO Batteries Ltd, Bangalore
SHRI R. K. HEBBER (*Alternate*)	
SHRI P. V. VASUDEVA RAO	Central Electrochemical Research Institute, (CSIR), Karaikudi
GENERAL MANAGER & PROJECT OFFICER	Free India Dry Accumulators Ltd, Calcutta
SHRI S. MAHADEV (*Alternate*)	
SHRI H. V. PANDE	Willard India Ltd, New Delhi
SHRI G. S. PATEL	Dowell's Elektro Werke, Bombay
SHRI T. B. HUNNUR (*Alternate*)	
SHRI S. SRINIVASAN	UB-MEC Batteries Ltd, Bangalore